Lunchtime Lectures

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Statistical analysis of a music database to investigate historical changes in the consonance and dissonance of pitch combinations in the chromatic scale

Abstract

As music changed historically, so too did concepts and percepts of consonance and dissonance (C/D). Assuming that consonant tone combinations generally occur more often than dissonant, we evaluted C/D by analyzing a representative database of unaccompanied vocal polyphony from seven centuries (13th to 19th). Method: We found electronic scores in the internet, assigned all pitches to the 12-tone chromatic scale, and used the Humdrum Toolkit (Huron) to count pitch patterns, labeling them as pitch-class sets (Forte).

For simultaneous tones, we considered chords of three pitch classes (triads). The most consonant triads in the 14th-16th centuries corresponded to today's major (in semitones: 047), minor (037), suspended (027) and diminished (036) in that order, plus 025/035 (e.g. CDF, DFG). With time, major and minor became relatively more common. We used this data to test psychological models of C/D based on roughness (fast beating), harmonicity (similarity to harmonic series), diatonicness (scale belongingness) and evenness (spacing around chroma cycle). Simultaneous C/D depended mainly on roughness, harmonicity and familiarity.

For successive tones, we considered tones that immediately precede and follow triads. Profiles were remarkably independent of preceding versus following as well as century, suggesting they were determined primarily by stimulus properties. We compared profiles with psychoacoustic predictions and results of listening tests, and tested whether profile peaks corresponded to chord roots, missing fundamentals, completion tones (to complete a familiar tetrad), fifth-related tones, or diatonic tones.

Short bio of Univ.-Prof. Dr.phil. Richard Parncutt:

Richard Parncutt is a music psychologist with an interdisciplinary PhD in Psychology, Music and Physics and an Honours (Master's) degree in Physics from the University of New England, Australia, and a Bachelor's degree in Music from the University of Melbourne. Since 1998, he has been Professor of Systematic Musicology at the University of Graz, Austria and since 2009 he has directed the university's Centre for Systematic Musicology. From 2015 to 2018 he is president of ESCOM, the European Society for the Cognitive Sciences of Music.

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